AYANNA M. HOWARD, PH.D.

EDUCATION

Ph.D. Electrical Engineering (Minor: Computer Science) May 1999
University of Southern California, Los Angeles, CA
Concentration in Artificial Intelligence/Robotics

M.S. Electrical Engineering (Minor: Computer Science) December 1994
University of Southern California, Los Angeles, CA
Concentration in Artificial Intelligence/Robotics

B.S. Computer Engineering May 1993
Brown University, Providence, RI
Concentration in Computers and Control

Masters of Business Administration (M.B.A.) 2002-present
Peter F. Drucker School of Management, Claremont Graduate School
Concentration in Strategy/General Management

PROFESSIONAL EXPERIENCE

Jet Propulsion Laboratory, Pasadena, California **1993-present**

Senior Member of Technical Staff – Telerobotics Research and Applications 9/02-present

- *Task Manager/Principal Investigator:* responsible for the state-of-the-art research development of an Artificial Intelligence software toolkit for interactive learning.
- *Technology Affiliate Task Manager:* responsible for securing funding for robotics/autonomy tasks. Manage portfolio of technology tasks to ensure innovative development.
- *Principal Investigator:* design software based on human cognition for landing a spacecraft safely on the Martian surface and for safe navigation of a planetary rover.

Member of Technical Staff – Telerobotics Research and Applications 2/99-present

- *Task Manager:* responsible for state-of-the-art research development of an adaptable software architecture for reconfigurable robotic systems
- *Task Manager:* manage team of software engineers in developing intelligent software tool for terrain-based analysis of the Martian surface for spacecraft landing
- *Principal Investigator*: design and develop a real-time software package for autonomous rover navigation on hazardous terrain for a NASA-funded project.

Member of Technical Staff - Information Technologies Research Section 1/97-2/99

- Using clustering and neural network techniques, developed software algorithms for identifying ground-based targets retrieved from spectral frequency data.
- Using neural networks, developed vision based recognition algorithms for real-time identification and tracking of airborne targets.

Member of Technical Staff **-** Advanced Technology Section 6/93-12/96

- Using UNIX Based OSF/Motif and the C programming language, created a GUI Toolkit for intelligent manipulation of military tactical groupings.
- Provided real time data analysis of intelligent neural systems for launch vehicle health monitoring through a computer graphics support unit.

TEACHING EXPERIENCE

University of Southern California, Los Angeles, CA **9/01 –5/02**
Adjunct Professor – Computer Science Department, School of Engineering

- Taught undergraduate courses focused on computer programming and development of applications using different programming languages (Java, Perl, XML).

Pasadena City College, Pasadena, CA **8/00-5/01**
Adjunct Professor – Math and Computer Studies Department

- Taught undergraduate courses focused on computer applications and computer programming.

California State University, Long Beach, CA **1/99-8/00**
Adjunct Professor - Engineering Technology, School of Engineering

- Taught undergraduate courses focused on computer applications, computer programming, and databases.

BOOKS AND CHAPTERS

1. A. Howard, Adventures in Science: On the Job with an Engineer, Lake Street Publishers, September 2003.

2. E. Tunstel, A. Howard, T. Huntsberger, A. Trebi-Ollenu, J. Dolan, "Applied Soft Computing Strategies for Autonomous Field Robotics," Fusion of Soft Computing and Hard Computing for Autonomous Robotic Systems, Physica-Verlag, 2002.

3. E. Tunstel, H. Seraji, A. Howard, Chapter 11: "Soft Computing Approach to Safe Navigation of Autonomous Planetary Rovers", Intelligent Control Systems Using Soft Computing Methodologies, CRC Press, 2001.

JOURNAL PUBLICATIONS

1. A. Howard, C. Padgett, "An Adaptive Learning Methodology for Intelligent Object Detection in Novel Imagery Data," to appear NeuroComputing, 2003.

2. E. Tunstel, A. Howard, "Approximate Reasoning for Safety and Survivability of Planetary Rovers," Fuzzy Sets and Systems, Feb. 2003.

3. E. Tunstel, A. Howard, H. Seraji, "Rule-based reasoning and neural network perception for safe off-road robot mobility", Expert Systems, 19(4), pgs. 191-200, Sept. 2002.

4. H. Seraji and A. Howard, "Behavior-Based Navigation on Challenging Terrain: A Fuzzy Logic Approach," IEEE Transactions on Robotics and Automation, 18(3), pgs. 308-321, June 2002.

5. A. Howard, H. Seraji, "An Intelligent Terrain-Based Navigation System for Planetary Rovers," IEEE Robotics and Automation Magazine, December 2001.

6. A. Howard, H. Seraji, "Vision-Based Terrain Characterization and Traversability Assessment," Journal of Robotic Systems, 18(10), pgs. 577-587, 2001.

7. A. Howard, G. Bekey, "Robotics Become Capable of Handling a Rubber Ball," Advanced Manufacturing Technology, John Wiley & Sons, Nov. 2000

8. A. Howard, G. Bekey, "Intelligent Learning for Deformable Object Manipulation," Autonomous Robots, 9 (1): 5-6, August 2000.

9. A. Howard, C. Padgett, “A generalized approach to real-time pattern recognition in sensed data,” Pattern Recognition, vol. 32:12, Dec. 1999.

CONFERENCE PUBLICATIONS

1. A. Howard, B. Werger, H. Seraji, “Integrating Terrain Maps into a Reactive Navigation Strategy” to appear IEEE Int. Conf. On Robotics and Automation, Taiwan, May 2003.

2. A. Howard, H. Seraji, B. Werger, “A Global Path Planner using the Terrain Traversability Index,” to appear Seventh International Conference on Automation Technology, Taiwan, May 2003.

3. A. Howard, H. Seraji, “A Rule-Based Fuzzy Safety Index for Landing Site Risk Assessment,” 9th International Symposium on Robotics and Applications, Orlando, FL., June 2002.

4. E. Tunstel, A. Howard, “Sensing and Perception Challenges in Planetary Surface Robotics,” IEEE Sensors, Orlando, FL., June 2002.

5. A. Howard, “A Novel Information Fusion Methodology for Intelligent Terrain Analysis," IEEE International Conference on Fuzzy Systems (FUZZ-IEEE), Honolulu, HI, May 2002.

6. A. Howard, H. Seraji, B. Werger, “Fuzzy Terrain-Based Path Planning for Planetary Rovers," World Congress on Computational Intelligence, Honolulu, HI, May 2002.

7. C.C.Liebe, S.Mobasser, C.J.Wrigley, Y.Bae, A.Howard, J.Schroeder, “Micro Sun Sensor,” IEEE Aerospace conference, Big Sky, Montana, March 2002.

8. S.Mobasser, C.C.Liebe, A.Howard, “Fuzzy Image Processing in Sun Sensor,” 10th IEEE International Conference on Fuzzy Systems, Melbourne, Australia, Dec. 2001.

9. S. Mobasser, C.C. Liebe, A. Howard, “Application of Fuzzy Logic in Sunsensor Data Interpretation,” 2nd International Conference on Intelligent Technologies (InTech’2001), Bangkok, Thailand, Nov. 2001.

10. A. Howard, E. Tunstel, D. Edwards, A. Carlson, “Enhancing Fuzzy Robot Navigation Systems by Mimicking Human Visual Perception of Natural Terrain Traversability,” Joint 9th IFSA World Congress and 20th NAFIPS International Conference, Vancouver, Canada, July 2001.

11. H. Seraji, A. Howard, E. Tunstel, “Terrain-Based Navigation of Planetary Rovers: A Fuzzy Logic Approach,” 6th Int. Symposium on Artificial Intelligence, Robotics and Automation in Space, Montreal, Canada, June 2001.

12. A. Howard, H. Seraji, E. Tunstel “A Rule-Based Fuzzy Traversability Index for Mobile Robot Navigation,” IEEE Int. Conf. On Robotics and Automation, vol. 1, pp. 3067-3071, May 2001.

13. H. Seraji, A. Howard, E. Tunstel, “Safe Navigation on Hazardous Terrain,” IEEE Int. Conf. On Robotics and Automation, May 2001.

14. E. Tunstel, A. Howard, H. Seraji, “Fuzzy Rule-Based Reasoning for Rover Safety and Survivability,” IEEE Int. Conf. On Robotics and Automation, May 2001.

15. C. Padgett, A. Howard, S. Udomkesmalee, “Shape Based Object Recognition Using a Fast Analog Convolution Processor,” NASA/DoD Second Biomorphic Explorers Workshop, Dec. 2000.

16. A. Howard, H. Seraji, “Real-Time Assessment of Terrain Traversability for Autonomous Rover Navigation,” IEEE/RSJ Intern. Conf. on Intelligent Robots and Systems (IROS 2000), Nov. 2000.

17. A. Howard, H. Seraji, “A Real-Time Autonomous Rover Navigation System,” World Automation Congress, June 2000.

18. A. Howard, G. Bekey, “A Learning Methodology for Robotic Manipulation of Deformable Objects,” World Automation Congress, June 2000.

19. A. Howard, C. Padgett, K. Brown, “Real Time Intelligent Target Detection and Analysis with Machine Vision,” World Automation Congress, June 2000.

20. A. Howard, G. Bekey, “Intelligent Learning for Deformable Object Manipulation,” IEEE Intern. Symposium on Computational Intelligence in Robotics and Automation, Nov. 1999.

21. A. Howard, C. Padgett, K. Brown “Intelligent Target Detection in Hyperspectral Imagery,” 13th Applied Geologic Remote Sensing Conference, March 1999.

22. A. Howard, C. Padgett, C. Liebe “A Multi-Stage Neural Network for Automatic Target Detection,” Int. Joint Conference on Neural Networks (IJCNN), May 1998.

23. A.M. Howard, G.A. Bekey, “Recursive Learning for Deformable Object Manipulation,” 8th Int. Conf. Advanced Robotics, pp. 939-943, July 1997.

24. A.M. Howard, G.A. Bekey, “Prototype system for automated sorting and removal of bags of hazardous waste,” Intelligent Robots and Computer Vision XV: Algorithms, Techniques, Active Vision and Materials Handling, Proc. SPIE 2904, pp. 271-277, Nov. 1996.

SPEAKING ENGAGEMENTS

1. “Robots in Space,” Astronomy Guest Lecture Series, Santa Monica College, CA, May 2003.
2. “The Souls of Black Folk (100th Anniversary)”, Tinker AFB Black History Month Banquet, Oklahoma, March 2003.
3. “Women Working on Mars,” National Engineers Week WebCast, Pasadena, CA, Jan 2003.
4. “Neural Networks, Robotics, Fuzzy Logic, Machine Vision, What’s It All About?” 2nd Annual Careers in Math, Science, and Technology Conference, CA, Jan 2003.
5. “Exploration of Mars,” Chabot Space & Science Center, Oakland, CA, May 2002.
6. “AI Techniques in Planetary Robotics,” NASA-Goddard Space Flight Center, March 2002.
7. Panel: “Women in Science,” Techbridge: Encouraging Girls in Technology WebCast, Pasadena, CA, January 2002.
8. “Careers at JPL/NASA,” Young African American Women’s Conf., Pasadena, CA, Oct. 2001.
9. “Robotics Research at JPL,” North Carolina A&T Computer Science Colloquium, Sept. 2001.
10. “Robotics and Artificial Intelligence”, Santa Monica City College, CA, March/Sept. 2000.
11. “Hybrid Systems: Effective ways to combine genetic algorithms, neural networks, and fuzzy systems for real-world applications,” World Automation Congress, Maui, HI, June 2000.
12. “Robotics in the 21st Century,” Society of Women Engineers Regional Conference, Santa Monica, CA, February 2000.

FEATURED ARTICLES

1. Science@NASA, "Brainy 'Bots," May 2001.

2. NASA Tech Briefs, “Who’s Who at NASA”, August 2001.

3. Mars Exploration Spotlight, “JPL's Bionic Woman, Dr. Ayanna Howard,” August 2002.

PROFESSIONAL ACTIVITIES AND AWARDS

Best Paper Award, 9th International Symposium on Robotics and Applications (2002)
NASA Honor Award for Safe Robotic Navigation Task (2002)
Lew Allen Award of Excellence for significant technical contributions (2001)
Associate Editor for Int. Journal of Intelligent Automation and Soft Computing (00-present)
Institute for Electrical and Electronic Engineers (IEEE) (92-present)
IEEE Computer Society (98-present)
American Association for Artificial Intelligence (AAAI) (99-present)
Senior Member of the Society of Women Engineers (SWE) (00-present)
NASA Tech Briefs Reader Advisory Panel (00-present)
Technical Recruiter – Division 34, Jet Propulsion Laboratory (99-present)
JPL Director’s Advisory Council for Women (99-01)

Alumni Interviewer for Brown Undergraduate Admissions (93–present)
JPL Technology and Applications Program (TAP) Honor Award (March 2000)
Board Member, Delta Sigma Theta Sorority Inc., Pasadena Chapter
Alumni, National Society of Black Engineers

COMMUNITY SERVICE ACTIVITIES

Chair and Founder, Pasadena Delta Academy (01-current)
- Mentoring program for young teenage girls focused on augmenting math, science, and technology education. Primary goal is to prepare young girls for full participation as future leaders in society.

Executive Board Member, JobStarts, Inc. (99-current)
- Nonprofit organization that helps individuals and families successfully gain economic stability, improved self-esteem, and self-reliance through work.

Engineering Advisor, FIRST (01-02)
- Nonprofit organization founded to inspire high school students to pursue careers in engineering through interaction with engineers and active participation in an annual robotics competition.

Space Expert, Challenger Center for Space Science Education - Space Day 2002
- Program designed to encourage students' interest in science, math, and technology by providing an opportunity to work with mentors and visiting space experts to solve real life space problems.

Computer Tutor, Restore, Inc. (98-current)
- Provide computer training and hardware support for volunteers of Restore, a shelter for battered women and children.

Co-Founder, JUMP (JPL Undergraduate Mentoring Program for Women) (01-current)
- Volunteer group focused on providing mentoring support to undergraduate students interested in pursuing a career in engineering, science, or technology-related field.

TECHNICAL/COMPUTER SKILLS

Software: Java, C/C++, Visual Basic, TCL/TK, Matlab, OSF/Motif, Assembly, LISP, Unix/Linux, Windows, Web Interface Design

Hardware: Sun Workstation, Macintosh, PC, IBM 7535 Robot Simulator, SkyBolt Vector Processor, Cascadable Neural Network Chip, Vision Camera, Pioneer